

NAC Technology and Innovation Committee Meeting Report

Esther Dyson
Chair, NAC Technology and Innovation Committee
August 6, 2010



- **OCT Update – R. Howard**
- **Open Collaboration and Innovation Model Presentation – J. Davis**
- **Centennial Challenges Program Update – A. Petro**
- **Joint Afternoon Session with NAC Exploration Committee**
- **Review of Human Exploration Framework Team – J. Olsen**
- **Review of planning and formulation for Crosscutting Capability Demonstrations programs – P. Desai**
- **OCT/ESMD Technology Coordination – J. Reuther**
- **Overview of ESMD New Technology Initiatives – B. Neumann**

T & I Committee Members



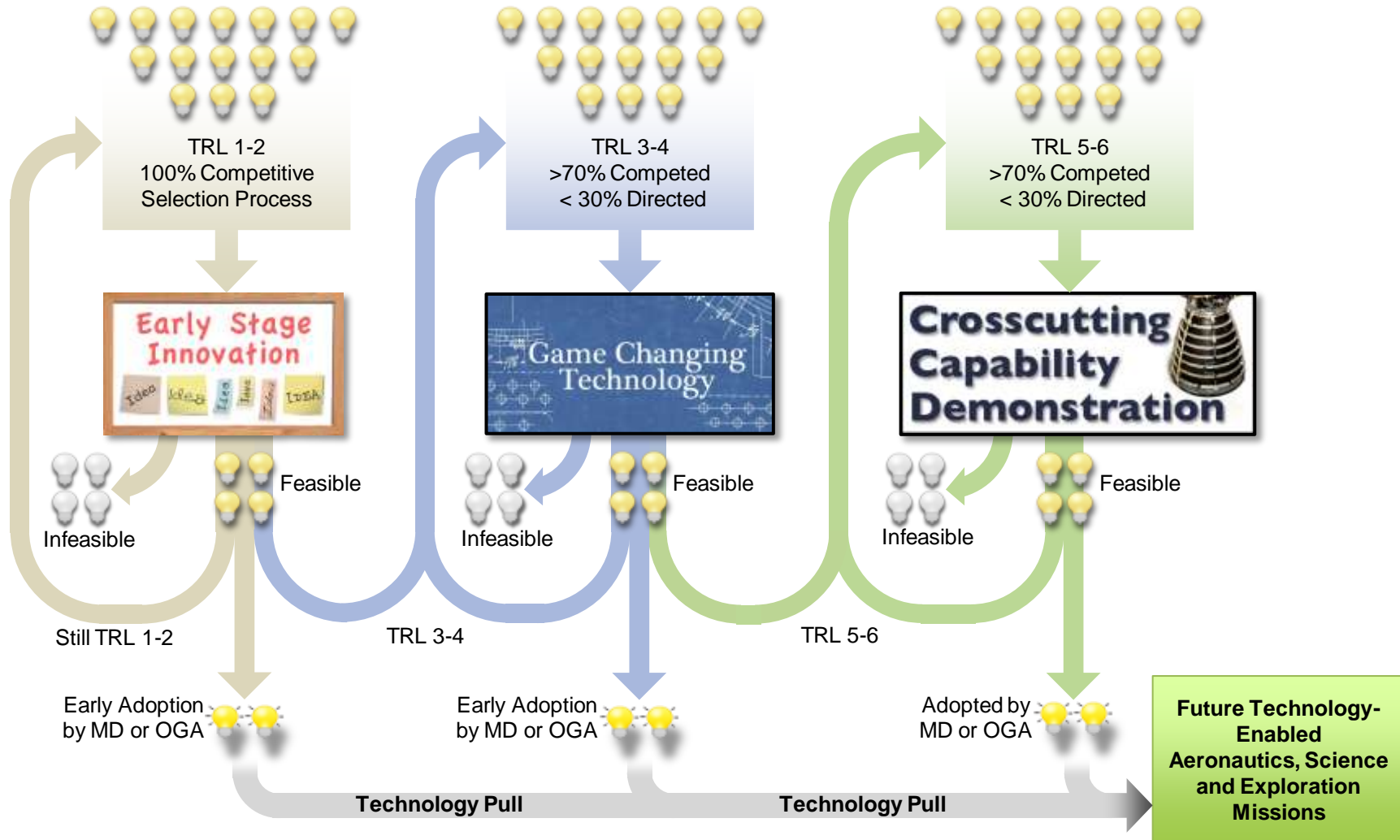
- Ms. Esther Dyson (Chair), Edventures Holdings
- Dr. Bill Ballhaus (Vice-Chair), Consultant, Retired aerospace executive
- Dr. John Cassidy, Consultant/retired
- Dr. Eric Haseltine, Haseltine Partners, LLC
- Dr. Matt Mountain, Space Telescope Science Institute
- Dr. Dava Newman, MIT
- Dr. Alain Rappaport, Microsoft Corp.
- Dr. Susan Ying, The Boeing Company
- Mr. G. Michael Green, NASA (Executive Secretary)

- **Space Technology is a new budget line in the President's FY11 Budget Request for NASA**
 - Consists of 10 technology development and innovation programs that are broadly applicable to the Agency's aeronautics, science and exploration enterprises
 - Managed by Office of the Chief Technologist (OCT)
- **OCT has chosen to manage these 10 programs through the formation of 3 Divisions**
 - Early Stage Innovation
 - Game Changing Technology
 - Crosscutting Capability Demonstrations
- **Space Technology builds on the success of NASA's Innovative Partnerships Program (IPP)**
 - In FY11, IPP is integrated into Office of the Chief Technologist and the IPP budget is integrated into the Space Technology Program

Space Technology Allows for a Range of Technology Development Pathways



Ideas submitted from Industry, Academia, NASA, and Other Government Agencies



- **Building on the success of NASA's Innovative Partnerships Program (IPP)**
 - 4 of the 10 programs
 - Centennial Challenges
 - SBIR/STTR
 - IPP Seed Fund → Center Innovation Fund
 - FAST and CRuSR → Flight Opportunities
 - Management Structure and Center Leadership
 - IPP Partnerships, Technology Transfer, Commercialization and Commercial Space → Partnerships, Innovation and Commercial Space
 - IPP Center field offices → Center Chief Technologist offices
- **In FY11, 40% of Space Technology line is IPP-related content**
- **Over FY11-FY15, 25% of Space Technology line is IPP-related content**
- **Formulation of the Space Technology programs was initiated in February and has proceeded rapidly and effectively.**
 - Integrated approach
 - Center personnel involved from the start
 - Plan has been stable
 - Broad external support

Space Technology Engagement with External Community To Date



- **Three Space Technology Programs - SBIR/STTR and Centennial Challenges and Flight Opportunities are proceeding with standard cycle of external engagements as part of FY10 NASA IPP activities.**
- **On May 4, 2010, OCT released a NASA Technology Research Fellowship letter to NASA Field Centers and Federal Laboratories requesting research area topics.**
- **OCT issued on May 25, 2010, three RFIs for the Technology Demonstration Missions Program, the Edison Small Satellite Missions Program, and the Small Satellite Subsystem Technology Program.**
- **Space Technology Industry Day on July 13-14, 2010**
 - **Over 300 participants from Industry, academia, and other government agencies.**
- **Internal program formulation process is proceeding on pace to allow release of Space Technology solicitations in early fall pending Congressional approval.**

Centennial Challenges Status

Since 2005, 19 competitions held in six Challenge areas,
\$4.5M in prizes awarded to 13 different teams

Completed

- Regolith Excavation – \$750K awarded
- Lunar Lander – \$2M awarded
- Astronaut Glove – \$550K awarded



On-Going

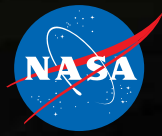
- Strong Tether – \$2M available
- Power Beaming – \$900K awarded;
\$1.1M available in 2010
- Green Flight – \$350K awarded;
\$1.65M available in 2011



New in 2010

Three New Challenges with \$5M available

2009 Centennial Challenges Highlights



Masten Space Systems and Armadillo Aerospace win Lunar Lander Challenge and as Space Entrepreneurs are honored as the "Persons of the Year"



Paul's Robotics, a student team beats 22 others to win \$500,000 in the Regolith Excavation Challenge



Ted Sothern and Peter Homer display their prize winning Astronaut Gloves



LaserMotive climbs to one kilometer with beamed power to win \$900,000

- Key components
 - Evidence-based risk management system
 - Continuously evaluates all human system risks across current and future operations, identifies gaps
 - Portfolio mapping of gaps to determine optimal collaborative strategy
 - "The new leaders in innovation will be those who figure out the best way to leverage a network of outsiders" – Gary Pisano, HBS
 - Implementation of disruptive innovation
 - New business models vs. traditional approaches/continuous improvement
 - Optimize SLSD research, technology, operations, and service portfolios through strategic alliances and collaboration (including open innovation)
 - Integrating system to blend old/new tools

InnoCentive: Open Innovation Pilot Example



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WHERE THE WORLD INNOVATES

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Seekers +
Solvers +
Challenges +

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Engineering and Design
Food & Agriculture
Life Sciences
Mathematics and Statistics
Physical Sciences
Requests for Partners and Suppliers

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Public Good and Citizens in Action

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NASA
Innovation Pavilion

Welcome to the **NASA Innovation Pavilion**, which provides Solvers the opportunity to develop innovative solutions to the unique challenges faced by NASA in achieving its mission to pioneer the future of space exploration, scientific discovery, and aeronautics research. Solutions to these challenges will not only benefit space exploration, but may also further the development of commercial products and services in the fields of health and medicine, industry, consumer goods, transportation, public safety, computer technology, and environmental resources.

[Johnson Space Center](#)
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Centers Participating in the NASA Innovation Pavilion

Johnson Space Center
The Johnson Space Center has been home to all U.S. human space flight programs. Our scientists and engineers are engaged in research and technology development projects encompassing human health and performance, life sciences, and aerodynamics, mechanical, electrical, industrial, propulsion, chemical, and computer engineering. We are seeking new and creative ideas to enable our success as we venture beyond low Earth orbit and further explore the universe.

PAUSE

Sort By: **Deadline** List By: **Descending** [Summary View](#)

Showing 3 out of 3 listings

Microsoft PowerPoint - [O... InnoCentive - NASA ...

InnoCentive Pilot: Phase 1 Results



Challenge Title	Challenge Type / Award	Final Numbers	Result
Improved food packaging	Theoretical (written proposal)— 60 days \$15,000	-174 Project Rooms from 33 Countries -22 Submissions from 10 Countries 16 for Evaluation	A partial solution (\$11,000 award) was found by a scientist from Russia for a flexible graphite material compatible with NASA requirements. NASA pursuing.
Compact, effective aerobic and resistive device	Theoretical (written proposal)— 60 days \$20,000	-564 Project Rooms from 52 Countries -95 Submissions from 24 Countries 60 for Evaluation	A full award has been made to a mechanical engineer from MA for his pneumatic suction device. The solution will be directly infused into current NASA prototype efforts.
Forecasting solar activity	Reduction to Practice (proof of idea/prototype)— 90 days \$30,000	-579 Project Rooms from 53 Countries -11 submissions from 5 Countries 4 for Evaluation	A full award has been made to a retired radiofrequency engineer from rural NH for his SPE prediction algorithm. NASA will work with the solver on implementation into an operational framework.

- Total of 3 challenges posted to the Pavilion on 5/27/10
 - Simple Microgravity Laundry System
 - Theoretical IP with award amount of 25K
 - Closure 7/27/10
 - Augmenting the Exercise Experience with Audio Visual Inputs
 - Theoretical IP with award amount of 20K
 - Closure 7/27/10
 - Medical Consumables Tracking (JSC & GRC)
 - Theoretical IP with award amount of 15K
 - Closure 7/27/10
- InnoCentive pilot program draft assessment and lessons learned report by 9/15/10

- Internal innovation through collaboration platform
 - Pilot contract awarded to InnoCentive
 - Site launches August 9th
 - Will provide an internal collaboration platform that facilitates internal problem solving and communication
 - The goal is to leverage the breadth and depth of NASA technical expertise
 - Pilot will include 10 Centers
 - 20 Challenges were purchased
 - 2 allocated to each center
 - Civil Servants may submit solutions
 - Awards will be given for winning solution and participation

- Federal Agencies interested
 - NIH (ISS utilization)
 - NIST (biomarkers, innovative technologies)
 - NSF (IdeasLab)
 - FAA AST (commercial space workshop)
 - Health and Human Services (multiple agencies)
 - ISS Partners (collaborative human system risk forum)
- Other organizations interested
 - Nike (health, exercise, nutrition)
 - GE (portfolio management, technology development)
 - Philips (technology development)
 - Virgin Galactic, Blue Origin (human system workshop)
 - FAA Center of Excellence

Crosscutting Capability Demonstrations Division



- *The Crosscutting Capability Demonstrations Division focuses on maturation to flight readiness of cross-cutting capabilities that advance multiple future space missions, including flight test projects where in-space demonstration is needed before the capability can transition to direct mission application.*
- *Matures a small number of technologies that benefit multiple customers to flight readiness status [Technology Readiness Level (TRL) 6] through Projects that perform relevant environment testing.*

Crosscutting Capability Demonstrations (CCD) Division includes:

- **Technology Demonstration Missions Program** which matures, through flight demonstrations, a small number of Agency crosscutting technologies in partnerships with the Mission Directorates, other government agencies, and industry
- **Edison Small Satellite Missions Program** which develops and operates a series of NASA-focused small satellite demonstration missions in collaboration with academia and small business
- **Flight Opportunities Program** which provides flight opportunities of reduced-gravity environments, brief periods of weightlessness, and high-altitude atmospheric research

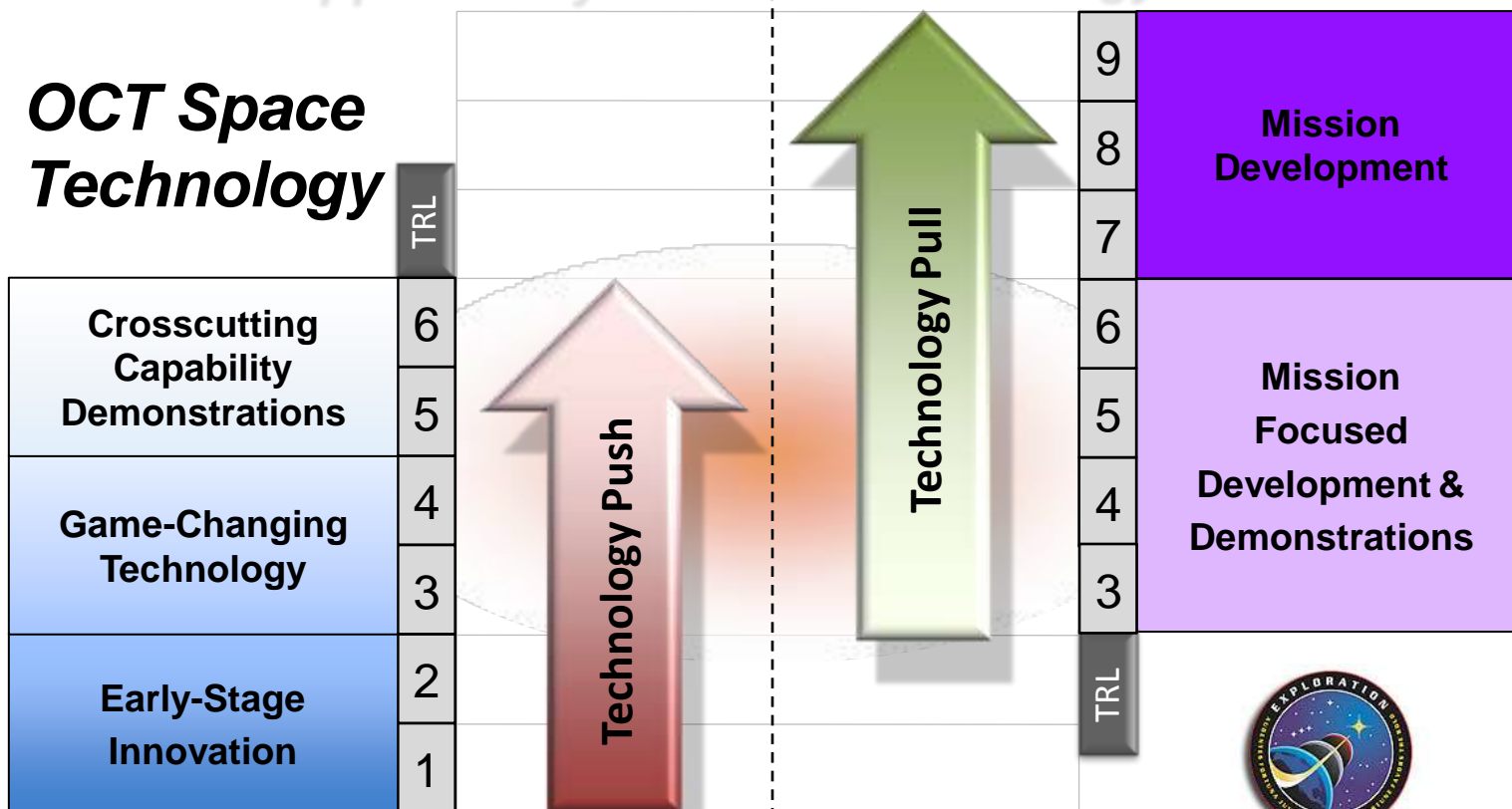
Greater than 70% of CCD funds (FY11-FY15) will be applied to competitive selections

Relationship with Mission Directorate Technology Programs (e.g., ESMD)



Developing Technologies with Broad Applicability...

...to Support Mission-Specific Technology Needs.



- OCT documented and received Agency-level concurrence on the “Process to Create and Maintain **NASA’s Aero-Space Technology Area Roadmap (A-STAR)**” – *released version posted with OCT policy documents at www.nasa.gov/OCT*
- A-STAR performs a Decadal Survey:
 - Creating a set of **15 cross-cutting Technology Area (TA) roadmaps** and links them to an integrated strategic roadmap to show the overall technology strategy and priorities across all of NASA’s technology investments
 - ✓ Responds to the OCT charter to provide “**Coordination of technology investments across the Agency**, including the mission-focused investments made by the NASA Mission Directorates, and perform strategic technology integration.”
 - Calls for thorough **internal and external roadmap content development and review** processes
 - ✓ Establishes a deliberative panel of internal and external stakeholders to review and advise on technology development priorities for the Space Technology Programs through a transparent and balanced process
- OCT’s Office of Strategic Integration was charged with executing the A-STAR process, with input from the NRC’s ASEB.

Roadmap Technology Areas



1	LAUNCH PROPULSION SYSTEMS
2	IN-SPACE PROPULSION SYSTEMS
3	SPACE POWER AND ENERGY STORAGE SYSTEMS
4	ROBOTICS, TELE-ROBOTICS, AND AUTONOMOUS SYSTEMS
5	COMMUNICATION AND NAVIGATION SYSTEMS
6	HUMAN HEALTH, LIFE SUPPORT AND HABITATION SYSTEMS
7	HUMAN EXPLORATION SURFACE SYSTEMS
8	SCIENTIFIC INSTRUMENTS, OBSERVATORIES, AND SENSOR SYSTEMS
9	ENTRY, DESCENT, AND LANDING SYSTEMS
10	NANOTECHNOLOGY
11	MODELING, SIMULATION, INFORMATION TECHNOLOGY AND PROCESSING
12	MATERIALS, STRUCTURAL AND THERMAL SYSTEMS, AND MANUFACTURING
13	GROUND AND LAUNCH SYSTEMS PROCESSING
14	THERMAL MANAGEMENT SYSTEMS
15	AERONAUTICS

Findings and Observations



- The Office of the Chief Technologist (OCT) should be commended for its outstanding efforts over the past six months in planning and formulating the new Space Technology program. The T&I Committee believes the mechanisms are in place for the Space Technology Program to move from program formulation to program execution once approved by Congress.
- The T&I and Exploration Committees support and applaud OCT for maintaining close communications and interactions with the ESMD, coordinating critical-path technologies and technology development required to execute a roadmap to future human exploration beyond low earth orbit (LEO). Because future technologies represent an area of overlap between OCT and ESMD, these interactions are critical to avoid duplication, cross purposes, and gaps. Such coordination should result not just in schedule and cost savings but also in better outcomes and effective execution.
- The T&I Committee was impressed by the Open Collaboration and Innovation Model being implemented by the Space Life Sciences Directorate at JSC. In particular, the InnoCentive, the NASA@Work Pilot, and the proposed NASA Human Health and Performance Center (NHHPC) efforts should be embraced, supported and spread in order to promote innovation, collaboration, and culture change across the Agency. [repeat of April? Next sentence is new.] Likewise, the entire Council was impressed with the TeamX collaboration process it saw during its tour of JPL.
- The T&I Committee and the Exploration Committee found much value in holding a joint afternoon session. Each Committee was exposed to new information and found great value in jointly discussing many important topics that affect both Committees and their NASA areas of interest.

Finding:

The Office of the Chief Technologist (OCT) should be commended for its outstanding efforts over the past six months in planning and formulating the new Space Technology programs. Additionally, there is strong and broad external support for the Space Technology Program. The T&I Committee believes the mechanisms are in place for the Space Technology Program to move from its program formulation phase and to begin program execution once approved by Congress. However, the uncertain resolution of the FY 2011 budget may cause a significant adverse impact on the OCT's ability to execute the new Space Technology program.

Recommendation:

The Technology and Innovation Committee recommends that NASA allow the OCT to begin program implementation activities for the new Space Technology programs. This should include the OCT requesting a budget anomaly to the forthcoming "Continuing Resolution," allowing the OCT to begin initial program implementation activities including the issuance of BAA's for the new Space Technology programs.

Recommendations



BACKGROUND:

Many factors can affect the morale and operational efficiency of an organization and influence the environment for creativity and innovation.

Policies, procedures, and practices that require adherence to bureaucratic rules at the expense of employee effectiveness foster resentment and diminish initiative.

FINDING:

The centrally-controlled, one-size-fits-all Federal Traveler travel management process is such an example. It uses a bureaucratic approach that instead of improving efficiency -- as was no doubt intended -- does just the opposite. It can frustrate the user, sap productivity, and undermine users' sense of professionalism.

RECOMMENDATION:

The Council recommends that a small ad-hoc NAC group work with NASA to identify the top three most egregious productivity and individual initiative killers (starting with FedTraveler), and determine their costs not just in money but also in employee time. This group should then make recommendations for either eliminating/replacing the offending policy and procedure or software, or replacing it with a small pilot program to establish a best-practice benchmark that might let NASA break out of government-wide solutions that fail to meet the interests of the agency and its people – and provide a positive example to other government agencies.